INDUCED THERMOLUMINESCENCE STUDY OF EXPERIMENTALLY SHOCK-LOADED OLIGOCLASE

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Artificially induced thermoluminescence (TL) in the oligoclase samples which were shock-loaded up to 27 GPa was measured. Essential increase of the TL sensitivity in relation to the total gamma-ray irradiation dose was observed only in the sample at the 27 GPa pressure. This result can be explained by the initiation of the additional radiation damages in the so high shocked oligoclace crystal lattice.

The study of artificial TL of feldspars shock-loaded in a wide pressure range shows that the method is very sensitive to lattice damages caused by shock /1-4/. However the reason for change of such TL characteristics as the TL sensitivity, the peak temperature, and full width of the peak at half the maximum of the peak (FWHM) is not quite clear. Consequently it causes troubles at quantitative interpretation of the TL data for shocked feldspar.

Earlier we have demonstrated the anomal increase of TL sensitivity for oligoclase experimentally shock-loaded at 13 and 27 GPa /4/. (The TL sensitivity is luminescence intensity per one mass unit of sample aliquot relative to one unit of radiation dose.) The aim of this work is further study of the TL behaviour of the oligoclase samples under their different irradiation dose.

The oligoclase samples experimentally shocked up to 27 GPa were irradiated by gamma-rays of ^{60}Co. The dose of irradiation varied from 50 to 350 krad. After each irratiattion the artificial TL was measured. According to the measurements at the dose of irradiation as high as 350 krad the intensity of TL does not reach saturation. The TL sensitivity of the oligoclase shocked at 27 GPa has a tendency to some increase with increase of the cumulative absorbed dose (see Fig). For this sample the increase of the cumulative dose by 1 Mrad causes increase of TL sensitivity calculated for 230-380 ^{o}C temperature interval by a factor 1.4 . The rise of the TL sensitivity for the oligoclase shocked at 27 GPa can be connected with increase of lattice defects concentration. The defects can be formed not only by

irradiation of the sample but also by its annealing during the measurements of glow curves. For the check of the last assumption we performed a number of experiments. All unshocked and shocked samples were heated up to 500 °C 10 times. Before each heating the samples were irradiated by relatively low dose of about 8 krad and TL sensitivities of the samples were measured. According to the data the repeated anneling does not lead to formation of new glow centers. Also we can conclude that the irradiation of the shocked at 9-25.5 GPa and unshocked oligoclases does not cause the appearance of the some additional lattice defects.

Thus, the obtained preliminary results give the possibility to explain the increase of TL sensitivity in the oligoclase which was shocked at 27 GPa. This effect can be explained by the increase of concentration of the defects in the oligoclase crystal lattice. At the same time the anomal growth of TL sensitivity in the oligoclase sample influenced by 13 GPa must have another nature. We assume that the results on high gamma-rays doses irradiation of shocked oligoclase samples allow us identify the shock event pressures lower or higher than the value of 27 GPa.

References.

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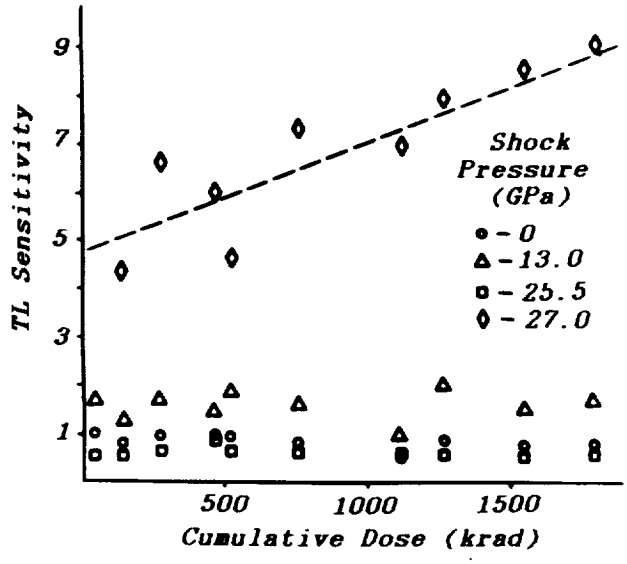

Fig. Plot of TL sensitivity against cumulative dose, by which oligoclase samples were irradiated before the TL measurement. The samples shocked up to 9.0 and 22.5 GPa have trends analogous to that for 25.5 GPa. The 1 σ uncertainty for the shock pressure data in all the cases is +- 30%.